Comparison of anterior uterocervical angle in unexplained primary infertile and primigravid cases

Anterior uterocervical angle and infertility

Fırat Kaya[1], Gulchin Babayeva[2], Yunus Emre Purut[1], Abdulaziz Gul[3]
[1] Department of Obstetrics and Gynecology, University of Health Sciences, Van Training and Research Hospital, Van
[2] Department of Obstetrics and Gynecology, Gaziosmanpasa Ekotom Medical Center, Istanbul
[3] Department of Obstetrics and Gynecology, Van Yüzüncü Yıl University, Van, Turkey

Abstract
Aim: The aim of this study was to investigate the hypothesis that narrow angle may prevent sperm passage and thus cause infertility by comparing anterior uterocervical angle (A-UCA) in patients with unexplained infertility and primigravid cases at early gestational week.
Material and Methods: This study included 126 cases, including 75 cases of unexplained infertility and 51 cases with a diagnosis of primigravid at early gestational week, who applied to the Van Yuzuncu Yil University Gynecology and Obstetrics Clinic between February 2021 and October 2021. A-UCA values of infertile cases were reviewed. Primigravid cases with β-hCG values of <1000 mIU/ml were included in the study. A-UCAs were measured with transvaginal ultrasonography and while the bladder was empty.
Results: In our study, no statistically significant difference was found between the increase in β-hCG value and A-UCA value in the pregnant group (p>0.05).
Discussion: It was found that the A-UCA did not show a significant difference between primigravid cases at early gestational weeks and unexplained primary infertile cases.

Keywords
Anterior Uterocervical Angle, Infertility, Unexplained Infertility

Introduction

Infertility is defined as the absence of pregnancy after 12 months of unprotected intercourse. This can be seen in 10-15% of couples [1]. Approximately half of the infertile couples can become pregnant in the second year of the trials without treatment. Although infertility treatment has made great progress, it is not possible for couples to have babies for some reasons that are still unexplained today, and this occurs in approximately 17% of infertile couples [2].

Unexplained infertility is defined as the absence of any pathology in the basic evaluation (sperm analysis, ovulation tests, hysterosalpingography, revealing there is no pathology in the cavity and tuba) in couples who cannot achieve pregnancy after 1 year of unprotected sexual intercourse. With the addition of evaluation with ultrasonography to the basic evaluation, myoma uteri, endometrioma, and decreased ovarian reserve findings can be detected in some of the couples with unexplained infertility [3, 4]. Problems in tubal passage, mild ovulatory dysfunction, luteal phase deficiency, and implantation abnormalities (e.g., decreased expression of essential endometrial cell surface receptor protein $\alpha\nu\beta3$ integrin, or low endometrial perfusion, etc.) are the factors that can lead to infertility although they cannot be explained by basic infertility tests [5]. Apart from these, factors that solely cause a minimal decrease in infertility potential being present in both of the partners can also cause unexplained infertility. It is not known in advance whether sperm/zona pellucida penetration can occur successfully since a semen analysis cannot fully demonstrate the functional capacity of sperms. This leads to the evaluation of some infertile cases whose etiology is male factors in the unexplained infertility group [6].

Anterior uterocervical angle is the angle formed between the longitudinal line connecting the internal and external cervical os and the longitudinal line connecting the anterior wall of the uterus and the internal cervical os. The importance of this angle in the field of gynecology and obstetrics has been increasing in recent years. Studies conducted in recent years suggest that narrow A-UCA in individuals with unexplained infertility may play a role in the etiology by preventing sperm passage; in addition, it was suggested that a wide angle may be effective in the etiology of preterm labor and cerclage success, while a narrow angle may be effective in dysmenorrhea and IVF success [4, 6-8].

In our study, we aimed to compare the A-UCA values in unexplained infertile cases and individuals at early gestational week (β-hCG<1000 mIU/ml), between 18-35 years of age, with a body mass index between 18-25, without any known comorbidities, who are non-smokers, and those who have not previously undergone gynecological surgery.

Material and Methods

A total of 126 patients included in the study consisted of 75 unexplained infertile cases, and 51 primigravid cases at early gestational week (β-hCG<1000 mIU/ml), who were aged between 18-35 who applied to the Obstetrics and Gynecology outpatient clinic of Van YuzuncuYil University Faculty of Medicine, Department of Obstetrics and Gynecology between February 2021 and October 2021, with no known comorbidities

and no history of previous surgery, with a BMI of 18-25 kg/m2 range, no smoking history, and not meeting any of the exclusion criteria of the study.

ESHRE (European Society of Human Reproduction and Embryology) and ASRM (American Society for Reproductive Medicine) guidelines were taken into consideration when making the unexplained infertility diagnosis. Informed consent was obtained from all patients in the study group. All patients were examined with a detailed anamnesis. Patients with anatomical, thrombophilia, genetic and immunological factors that would exclude the diagnosis of unexplained infertility and patients who were obese, had previous gynecological operation history and secondary infertility were excluded from the study. Unexplained infertile cases documented by ultrasonographic, radiological, hormonal examination and semen analysis, and primigravid cases at early gestational week (β-hCG<1000 mIU/ml) were included in the study. Since it is known that the cervical angle changes with the progression of pregnancy, the β-hCG value in primigravid cases was limited to 1000 mIU/ml in order to minimize the measurement differences that may occur accordingly.

Age, height, weight, and body mass index (BMI) were measured and recorded in both patient groups. In some of the cases, laboratory and imaging results performed in the health center they previously applied were evaluated and recorded. In the menstrual history, cycle lengths, irregularities, dysmenorrhea were questioned and recorded, if any. All patients included in the study underwent detailed general physical and gynecological examination, and ultrasound and hysterosalpingography were preferred for uterine anomalies. FSH, LH, TSH, prolactin levels on the 2nd day and serum progesterone levels on the 21st day of menstruation in unexplained infertile cases, sperm analysis of the spouses and B-hCG values in primigravid cases were subjected to a detailed examination. Then, the A-UCA angles of the two groups were measured with the same USG device, while the bladder was empty, in the gynecological position, and transvaginally by the same person, and recorded (Figure 1).

Our study was submitted to Van Yuzuncu Yil University Clinical Research Ethics Committee and approved on 03.31.2021 with the number 18.

Statistical analysis

In the descriptive statistics of the data, mean, standard deviation, median, lowest, highest, frequency, and ratio values were used. The distribution of the variables was tested using the Kolmogorov-Smirnov test. Quantitative independent data were analyzed using the Mann–Whitney U test. Spearman's correlation coefficient was used for correlation analysis. SPSS 27.0 program was used in the analyses.

Results

Anterior uterocervical angles were measured in all cases in the range of 66°-138°. The narrowest angle in unexplained infertility cases was 66°, the widest angle was 120°, the mean was (99.0±10.9) degrees; the narrowest angle in the primigravid group was 73°, the widest angle was 138°, and the mean was (100.3±12.8) degrees (Figure 2).

The mean age of the patients included in the study was 25 years; the mean age was 26.0 in the infertile patient group, while it

Table 1. Comparison of demographic characteristics between groups

	Min-Max	Median	Mean ± SD / n (%)
Age (years)	18.0 - 35.0	25.0	25.8 ± 4.3
BMI (kg/m²)	19.0 - 30.0	22.0	22.4 ± 1.7
B-hcG (mIU/ml)	10.0 - 951.0	283.0	346.1 ± 288.8
Uterocervical Angle (°)	66.0 - 138.0	99.0	99.5 ± 11.6
Primigravid Group			51 (40.5%)
Unexplained primary infertile group			75 (59.5%)

Table 2. Classification of the groups by their BMI values

|	BMI (kg/m²)			p
	Min-Max	Median	Mean ± SD	
Primigravid Group	19.0 - 25.0	22.0	22.3 ± 1.8	0.883m
Unexplained primary infertile group	20.0- 30.0	23.0	22.5 ± 1.7	

m Mann-Whitney U test

Table 3. Uterocervical angles of the groups

	Uterocervical Angle (°)			p
	Min-Max	Median	Mean ± SD	
Primigravid Group	73.0 - 138.0	99.0	100.3 ± 12.8	0.794m
Unexplained primary infertile group	66.0- 120.0	98.0	99.0 ± 10.9	

m Mann-Whitney U test

Figure 1. Anterior uterocervical angle
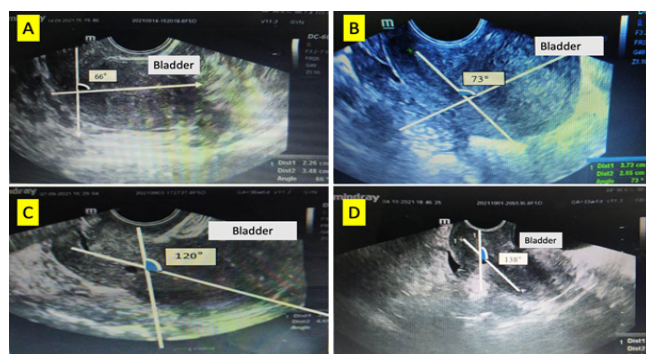
Figure 2. The narrowest angle measured in the unexplained primary infertile group (A) and in the primigravid group (B). The widest angle measured in the unexplained infertile group (C) and in the primigravid group (D).

was 24.0 years in the early pregnancy group. Demographic characteristics of the subjects are presented in Table 1.

No significant correlation was observed between the increase in β-hCG value and A-UCA value in the primigravid group (p >0.05). A-UCA angles were found to be narrower in the unexplained primary infertile group. However, there was no statistically significant difference between the A-UCA values of the two groups compared to the cases in the primigravid group (p > 0.05) (Table 3).

Discussion

Although it has not been studied enough in the literature, the importance of the angle between the uterus and the cervix has been the subject of some recent studies. Studies have shown that a narrow anterior uterocervical angle may prevent sperm passage and thus complicate pregnancy, increase cerclage success, increase dysmenorrhea, and especially risk of preterm birth with a wide angle has been particularly emphasized [5, 6, 8-11].

In a prospective study by Madendag et al., in the angle measurement of 50 unexplained infertile cases and 30 primigravid fertile cases at early gestational week, the anterior uterocervical angle was wider in the primigravid group than in the unexplained infertile group, and based on this result, it was concluded that narrow A-UCA might be associated with unexplained infertility etiology [8]. On the other hand, in our study with a larger participant group, there was no significant difference between the unexplained infertile group and the primigravid group in terms of A-UCA values, and no correlation was found between angle and infertility.

In another retrospective study conducted by Knight et al., the effectiveness of anterior uterocervical angle in cerclage success was investigated [9]. For this purpose, 142 pregnant women who had cerclage over a 5-year period were retrospectively reviewed; cervical characteristics, cervical length, cerclage levels, and volume of becoming funnel-shaped were recorded with endocervical USG, and their anterior uterocervical angles were measured before cerclage, immediately after cerclage, and just before delivery. Cerclage was considered unsuccessful in deliveries before 36 weeks. At the end of the study, cerclage was unsuccessful in 38% of cases. It was revealed that cerclage failure increased with the expansion of the anterior uterocervical angle [6]. Again, in a study conducted by Sahin et al. on 150 patients diagnosed with primary dysmenorrhea and 50 healthy volunteers, after grouping the patients by pain severity, it was concluded that there was an inverse relationship between pain severity and anterior uterocervical angle, and the angle was narrower in patients with severe pain, the angle was different among those with mild, moderate and severe pain, and based on this result, it was concluded that a narrow anterior uterocervical angle may play a role in the etiology of dysmenorrhea [11]. Although these studies used a similar method to our study during the measurement of A-UCA, it is obvious that the studies were conducted for different purposes and with different case groups.

There are a limited number of studies on the relationship between anterior uterocervical angle and fertility. We believe that further extensive and numerous studies on this topic are

required.

Conclusion

In a similar study conducted with lower β-Hcg values and smaller number of participants, it was suggested that the anterior uterocervical angle was different between two patient groups, that A-UCA was narrower in the infertile group, and therefore it could have played a role in the etiology of unexplained infertility. As a result of our study, there was no statistically significant difference between the primigravid cases in the early gestational week and unexplained infertile cases for the anterior uterocervical angle, which is thought to play a role in the etiology of unexplained infertility, and we think that more randomized controlled studies are necessary in this regard.

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